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MEDICINE

A Monthly Record of the World's Progress in Medicine and Surgery

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opportunity to physicians from all parts of the United States, and many medical men in distant parts of the country were not able or willing to undergo the expense of a trip to Washington with the uncertainty of passing the examination. By the new method this will be obviated, as the preliminary examination will be held in different parts of the United States, as, for instance, New York, Boston, Chicago, St. Louis, New Orleans, San Francisco, and other cities. Candidates passing this preliminary examination will be sent without expense to themselves to the Army Medical School, will there receive the course of instruction, and a suitable number standing highest in the class will be given commissions in the regular medical department. Those failing to obtain commission will be returned to their homes, having had the benefit of a postgraduate course and training in the methods of the medical department of the army. The school will thus furnish a number of trained physicians, who, failing to obtain positions in the medical corps, will be available for the national guard or in time of war as volunteer medical officers. This with the instruction of medical officers of the national guard will disseminate a knowledge of military medicine, surgery, and hygiene among the surgeons of the country at large.

It is hoped that this new method of recruiting the medical department of the army will tend to increase the efficiency of the army, in that it will enable men from all parts of the United States to take the examination for entrance into the medical department of the army, so increasing the number of competitors and thereby insuring the entrance of able men. Also in this way the medical department of the army will be brought into more direct relation with the medical profession in all parts of the country, for it will have representatives from all parts of the United States, while graduates who have taken the course at the Army Medical School, but fail to obtain commissions, will return to the practice of their profession with the added advantages of a valuable postgraduate course.

It may be said that members of the medical profession who enter the medical department of the army separate themselves in part from their brethren in the profession at large. This is in part true, in that their lifework lies along different lines. Their work is more or less of a special character, and their interests are in part different from those of their brothers in civil life. Nevertheless this is true in part only, and the relation of the medical department of the army to the profession is a most intimate one. The medical department is recruited from the profession at large, and is in touch with all the great interests of the medical profession. Problems of national importance, affecting both the general profession and the army, have to be dealt with by them. Numerous instances could be given, but it is perhaps only necessary to mention such as the work of Reed and Carroll in relation to yellow fever, and of Billings in perfecting the library of the Surgeon-General's office. The first was most far-reaching in national and international importance, and the latter by building up one of the greatest medical libraries in the world has given opportunity for literary research to every physician throughout the country. Any physician can obtain books from the library on application to the librarian, and by depositing the value of the books with him until their return.

It may be of interest to you to know that though this library is maintained by an appropriation from Congress, and though this appropriation has been sufficient for current expenses, Congress has been regularly asked for several years to appropriate a small amount of money to purchase necessary book stacks, these being urgently needed for the preservation of valuable books, and that so far Congress has failed to appropriate anything for this purpose. In consequence many valuable books are piled

upon the floor and in obscure parts of the library building, where they are difficult of access and cannot be properly cared for. As the growth and preservation of this library is a matter of moment to all members of our profession, if you can by any means call the attention of Congress to the necessity for the preservation of these valuable works and so aid in securing the necessary appropriation, you will be doing the profession a great service.

It is only by mutual assistance and support that our profession can attain its highest ends. This is true not only of the various individual members of our profession, but of the various professional societies formed for the advancement of medical knowledge, of which your society is a worthy example. It is equally true relative to the relation which for the common good must exist between the various branches of our profession in the public service, such as the medical departments of the Navy, the Army, the Public Health and Marine Hospital Service, and the profession at large.

In the past the relationship between the officers of the medical department of the army and the profession at large has always been close, and thereby the officers of the medical department have been kept in touch with the great advances in medicine and surgery which the civil practitioner in time of peace has the greatest opportunity to practice. In return, in time of war the civil practitioner called into the military service has to look to his brother in medicine, who has spent his life in the military service, for those details of medico-military work upon which the efficiency of an army depends, and by which sickness and suffering may be prevented or alleviated under the conditions which obtain in war. At all times, therefore, the greatest good to the greatest number and the best interests of the nation demand that the most cordial relationship, association, and unity of endeavor should obtain between the medical department of our army and the profession at large; and that as time goes on, our community of interest, mutual support, and work toward the common good of our fellows and our country will increase, rather than diminish, I am sure can be argued from the high standard of unselfish endeavor which has always been so prominent a characteristic of the profession of medicine.

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THE INTESTINAL AND STOMACH REFLEXES.

BY ALBERT ABRAMS, A.M., M.D., SAN FRANCISCO, CAL.

The writer has in the literature repeatedly referred to the heart reflex and the lung reflexes of contraction and dilatation, and more recently to the *liver reflex*.[1] The reflexes in question possess more than mere theoretic interest. They give unequivocal demonstration of the fact that the sensory peripheral nerve terminations receive impressions which are conducted, communicated, or reflected by aid of the nervous system. Such impressions react on the viscera, and the manifestations of the reaction may be employed in a diagnostic and therapeutic direction. The noteworthy investigations of Head show that in visceral disease, pain and disturbed sensation may be referred to definite cutaneous areas. Clinicians have given due regard to this cutaneous expression of visceral disease, which, if I may be permitted to call it, is practically an endogenetic skin reflex. They have, however, ignored the fact that we are likewise in the possession of exogenetic skin reflexes. It is within the realms of reason to hope that by means of the latter reflexes we will be able to determine the condition of a

viscus with as much precision as is now attained in the electrodiagnosis of a nerve and muscle.

Many observers in this country, notably Cabot[2] and Monell, have recognized the practical value of my reflexes. At a meeting of the Société Médicale des Hôpitaux (July 24, 1903), M. Pierre Merklen and M. Jean Heitz read a paper on the "Reflexe Cardiaque d'Abrams"[3] and not only confirmed but extended my observations. In England, Auld[4] refers to the practical value of the "Lung Reflex of Abrams," in diagnosis and treatment. His observations show that much light was shed on the state of the lungs by testing their response either in whole or in part to the normal reflexes, and he suggests that the latter should be tested as a matter of routine in the investigation of cardiopulmonary diseases, just as the reflexes are tested in the investigation of diseases of the nervous system. The surgeon may boast of many triumphs in abdominal surgery, but in the esoteric domain of the internalist the abdomen yields but meager information to the conventional methods of physical exploration. The latter observation refers with all cogency to enteric diseases. Percussion and auscultation, which prove of inestimable service in the diagnosis of affections of the chest, often fail when employed in the investigation of abdominal disease. It is evident, then, that we should not heedlessly disregard in abdominal diagnosis the introduction of any aid even though it suggests a modicum of service. The abdominal cavity viewed in the light of its reflexes may be regarded as the analogue of the thoracic cavity. Nature seeks in her simplicity to duplicate rather than to complicate her physiologic mechanism. The lung has an inherent power of contracting and dilating apart from the breathing forces, and this inherent capacity can be evoked by stimuli applied to the skin of the chest or to the interior of the nares. Similarly, the intestines and stomach are likewise endowed with this inherent capacity to contract or dilate independent of intraintestinal or gastric pressure. And furthermore, the anus as a reflex center may be regarded as the analogue of the nares. To properly appreciate the intestinal and stomach reflexes, to which reference is here made for the first time, I am constrained to succinctly summarize my observations with relation to the lung reflexes of dilatation and contraction and the nasal reflexes. The practical value of the latter reflexes will not be referred to in this contribution, for which reference must be made to my original contributions.

The Lung Reflex of Dilatation.[5]—Briefly, this is a circumscribed lung dilatation evoked by a cutaneous irritant. Dilatation of the lung begins and spreads from the source of cutaneous irritation involving primarily circumscribed lung areas. By gradually applying the irritant to different parts of the skin of the thorax, lung dilatation will ensue involving more extensive areas contiguous to the chest wall. The *x*-rays, aside from percussion, furnish indisputable evidence of this reflex. The rays show that after application of the cutaneous irritant the lungs yield a more intense luminosity, which does not last longer than three minutes (the normal duration of the lung reflex of dilatation), after which time the lungs resume their normal appearance. Percussion of the epigastrium and irritation of the nasal mucosa induce this lung reflex synchronously in both lungs, whereas cutaneous irritation will evoke the reflex in a circumscribed area of lung only contiguous to the source of irritation.

The Lung Reflex of Contraction.[6]—Cherchevsky[7] directed attention to a sign which he regarded as significant of early arteriosclerosis. He contended that in normal conditions the diameter of the aorta varies at different times. It will become dilated if the region over the arch is struck with the percussion hammer, while it shrinks in size if the blows are struck in the epigastrium. In arteriosclerosis it is impossible, he

maintains, to produce these variations in diameter. The author has misinterpreted the phenomena obtained by his maneuver. What he really elicits is a circumscribed lung contraction adjacent to the part struck on the chest by the hammer, and the blow on the epigastrium merely causes the lung area to dilate, thus evoking the counter reflex of dilatation; after this manner, resonance supplants dulness. My investigations demonstrated that dulness could be obtained in other thoracic regions occupied by the lungs. To elicit this reflex I employ an S. S. white dental mallet weighing about four ounces and a pleximeter of felt. In the absence of the latter the ordinary percussion hammer and a large cork may be used, although less effectively than the mallet and pleximeter. The pleximeter is firmly applied to the region where the reflex is to be elicited, and with the mallet the pleximeter is struck a series of sharp, vigorous blows. The circumscribed dulness thus induced lasts but a few seconds, but may be made to disappear at once by striking the epigastrium. Observed with the *x*-rays, the phenomenon in question is a most interesting study in a susceptible person. After the blow is struck the adjacent lung area becomes gradually dark, showing that the air has been expelled from the lung, whereas, in a few seconds, the area implicated in the reflex becomes bright again. This reflex cannot be obtained if the nasal mucosa has been previously cocainized, nor if the skin is irritated over the lung area, for then the counter-reflex of lung dilatation, which is more pronounced as a reflex, is elicited.

The Nasal Reflexes.—Seven years ago, in a paper entitled "A contribution to the study of heretofore undescribed neuroses of the lungs,"[8] I demonstrated that lung inflation could be influenced in the nasal mucosa in two different directions by indirect action on the vagus. There was one set of nerve fibers in the nasal mucosa which when irritated would produce lung dilatation, and there was another set which by their tonus kept certain areas of lung in a condition of tonic contraction. The latter areas gave rise to patches of dulness which I called *atelectatic zones.* When the tonus of the nerves which maintained the zones was inhibited by cocainization of the nasal mucosa, the implicated areas of lung contraction (atelectatic zones) were released and passed into a state of dilatation. Nothnagel[9] refers to my observations on this subject and asserts that the atelectatic patches have no pathologic significance, and then adds by way of contradiction that they indicate debility on the part of the patient. The atelectatic zones in question may be essentially physiologic, and in such instances I have frequently found an entire lobe or even an entire lung to be in a state of more or less tonic contraction. Again, such patches may prove of

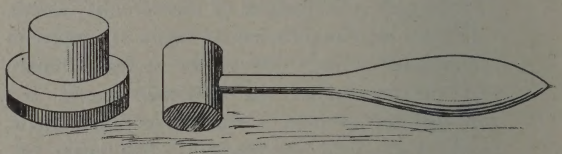

FIG. 1.—Mallet and pleximeter for evoking the lung reflex of contraction as well as the intestinal and stomach reflexes of contraction.

serious pathologic import as being the points of election and paths of distribution of the lesions in chronic pulmonary tuberculosis.[10] Such patches are also associated with an intractable form of anemia, which I have specified as pulmonary anemia,[11] in which there is neither a deficiency of hemoglobin nor of erythrocytes, but a condition in which oxygen is lacking, an anoxemia. Pulmonary anemia is rebellious to treatment with the ferruginous preparations, but yields at once to properly directed respiratory exercises. In my original contribution anent the nasal reflexes I insisted on the necessity of hypothesizing the existence of two distinct functions of the vagus, or at any rate of different fibers, with two distinct functions—fibers which can dilate (bronchodilator nerves) and fibers which can contract (bronchoconstric-

tor nerves) the lungs upon application of the appropriate stimuli. What I had then deduced as the result of mere clinical observation seems recently to have been conclusively established by the experimental investigations of Dixon and Brodie.[12] The latter found that the bronchial muscles are innervated by two sets of fibers, constrictor and dilator sets, both of which run in the vagus. In later communications[13] I demonstrated that typic asthmatic paroxysms could be produced by irritating the nasal mucosa, that nasal irritation in many individuals would reproduce the clinical picture of an emphysema, and furthermore that the heart reflex could in most instances be more effectually discharged through the nose than in the conventional way —by irritating the skin of the precordial region. Recently I have succeeded in inducing through the nose the lung reflex of contraction, whereby both lungs may be brought into a condition of tonic contraction, but I will reserve consideration of the latter for a book on "asthma," which is now in course of preparation.

The Cardiosplanchnic Phenomenon.—It will be necessary for me to dwell briefly on this phenomenon.* It consists of a dull percussion tone supplanting resonance in the lower sternal region, after vigorous abdominal compression, and is caused by determination of blood from the splanchnic veins to the right heart. Forced inspiration will at once dispel the phenomenon.

Passing on to the consideration of the intestinal and stomach reflexes and the reflexes discharged from the anus, one may observe the close relationship existing between these and the reflexes already described.

The Intestinal Reflexes of Contraction.—If we employ the mallet and pleximeter, after the manner described in eliciting the lung reflex of contraction, over the skin of the abdomen contiguous to any coil of intestine, we may observe in any given region of tympanicity after a succession of blows that the tympanitic tone previously obtained by percussion now suggests dulness, or at any rate dull tympanicity. This transition from tympanicity to dulness may be obtained in any region of the abdomen, front or back, occupied by the intestines. Of all the reflexes previously described, this particular reflex is of longest duration. In some individuals it may persist for five or more minutes, and it is more evident and longer in duration in children than in adults.

The Intestinal Reflex of Dilatation.—The former reflex may be at once dissipated by eliciting this counter-reflex either by vigorous tapping of the epigastrium by means of a percussion hammer or the mallet or even the fingers, or by cutaneous irritation by aid of a blunt pencil or vigorous rubbing of the skin. Here again the similarity of the intestinal to the lung reflexes is at once evident. If one irritates the skin of the abdomen, the intestinal reflex of dilatation is merely circumscribed, but it becomes more diffused and involves a larger intestinal area if the epigastrium is percussed. The intestinal reflex of dilatation is less pronounced and of shorter duration than its counter-reflex of contraction.

The Stomach Reflex of Contraction.—To elicit this reflex, our field of observation is limited to the Traube area, that half-moon-shaped space which normally yields on percussion a tympanitic sound owing to the presence of the cardiac end of the stomach. The Traube area is bounded above and laterally by the contiguous borders of the liver, lung, and spleen. Firmly fixing our pleximeter in the center of the Traube area of tympanicity, we strike the pleximeter with the mallet a series of vigorous blows and then proceed to percuss the area in question. One at once observes that this region which formerly yielded a tympanitic sound now presents on percussion a dull or even flat sound. The phenomenon thus obtained is the stomach

*This phenomenon is discussed in detail in a work now in press on "Splanchnic Neurasthenia," which is to be published by E. B. Treat & Co., New York.

reflex of contraction. It is of variable duration. The dulness replacing the tympanitic sound cannot be due to the lung reflex of contraction; if it were dependent on the latter, the fundus of the stomach would extend over a larger area, and increased tympany rather than dulness would be the result. If the lower border of the stomach is determined by percussion after the method of introducing water in the stomach through the stomach tube, and then the method for eliciting the stomach reflex of contraction in the Traube area is executed, it will be noted that the lower border of the stomach can be made to rise an inch or more. After introduction of the gastrodiaphane into the stomach, the method for provoking this stomach reflex causes the stomach to contract upward and to the left.

The stomach reflex of contraction is most conspicuous when the patient is examined before the Roentgen rays. According to this method the stomach is moderately distended by air after the conventional manner, and then percussion is executed by aid of mallet and plexiimeter in the Traube area. One at once observes after administration of the vigorous percussion blows that the fundus of the stomach will recede fully an inch or more. To the gastrologist this method suggests an accurate means of gauging the motor power of the stomach.

The Stomach Reflex of Dilatation.—Having carefully outlined by aid of a dermograph the tympanitic percussional area of Traube's space, rub the skin of this region vigorously, or better still scratch the skin by means of a blunt pencil, and note immediately thereafter that the area of tympanicity has become augmented. Tapping the epigastrium will often bring about the same condition of things to a greater degree. This is the stomach reflex of dilatation, which is of short duration, and rarely or never so pronounced as the counter-reflex of contraction.

The Anal Reflexes.—The anal orifice when considered as a reflex center is the practical analogue of the nares. When the rectal mucosa is irritated the heart reflex may be induced. If the same mucosa is irritated by means of the finger introduced into the rectum, the intestines may be brought into a sudden though momentary state of inflation, just as we may induce the lung reflex of dilatation by irritation of the nasal mucosa. If the rectal mucosa has been previously cocainized, the intestinal reflex of dilatation will not ensue incident to irritation of the rectum. The same procedure already suggested for bringing the lungs into a condition of diffused contraction has a similar action when applied to the rectal mucosa.

Explanation of the Altered Percussion Sounds in the Intestinal and Stomach Reflexes.—We will concede that the intestines and stomach yield normally on percussion a tympanitic sound, the pitch of which necessarily varies. Thus if the air or gas in the intestines or stomach is under considerable tension, pitch becomes higher, and the volume and intensity so decrease that percussion will yield a dull sound or dull tympanicity. Now in the intestines and stomach the tympanitic sound is caused by the periodic vibration of the air or gas within them. If for any reason the intestinal or gastric walls are made tense, vibration is induced by percussion not only of the contained air or gas but also of the walls; the result will be that the vibration of the walls and gas becomes mutually disturbed and the conventional tympanitic tone is lost. This is the Skodaic interpretation of the condition which exists when dulness supplants tympanicity. We are constrained to assume that in the intestinal and stomach reflexes of contraction the walls of the former have become tense, thus putting the air or gas within them under increased tension, and for this reason we have the physical elements necessary for the transition of a tympanitic to a dull sound. We have reason to assume that in the reflexes of contraction under consideration the

intestinal and stomach walls are brought into a condition of contraction. Thus, if the perimeter of the abdomen is determined by means of a cyrtometer before and after the application of the sinusoidal current to the abdomen, which is a powerful agent for exciting the intestinal reflex of contraction, we will note that the perimeter of the abdomen is considerably reduced.

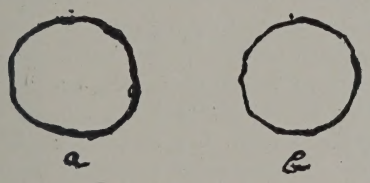

FIG. 2.—Perimeter of the abdomen before (*a*) and after (*b*) the application of the sinusoidal current to the abdominal walls. Duration of application of the current, five minutes.

In the reflexes of dilatation the intestinal and stomach walls are relaxed. The degree of inflation of the stomach and intestines varies from hour to hour, and may be quite independent of the presence of air or gas. Not infrequently a given intestinal coil will yield a dull tone on percussion which becomes tympanitic if the epigastrium is percussed, the rectal mucosa is irritated, or friction of the skin contiguous to the intestinal coil is executed. Any of the latter maneuvers cause relaxation of the walls of the intestine and bring out in consequence the tympanitic tone. As in the lungs, we must hypothesize the existence in the abdomen of a reflex nervous mechanism which controls dilatation and contraction of the stomach and intestines, and it is the constant action of this mechanism which preserves their normal caliber by the tonic antagonistic contraction of the muscular fibers.

The Clinical Value of the Intestinal Reflex of Contraction.—Only a few practical points will be cited, although the phenomenon in question suggests many possibilities to the gastroenterologist. Just as the motor power of the stomach is determined by the experimental meal or salol test, the motor power of the intestine may be gauged by this reflex. In habitual constipation this reflex is only slightly in evidence. In neurotic persons meteorism is a frequent condition. It may be dependent on insufficient motor power of the intestines or on congestion of the splanchnic veins. If dependent on the former, the intestinal reflex of contraction is diminished or even inhibited; if due to the latter, the cardiosplanchnic phenomenon is present to an exaggerated degree. My theory of tympanites in many neurotics is as follows: I assume that the intestines and abdominal veins represent two chambers containing a mixture of gases in unequal amount; diffusion takes place until the percentage amount of each gas in each chamber is the same. Owing to stasis of blood in the abdominal veins in many neurotics, the veins contain a larger quantity of carbonic acid, hence carbonic acid diffuses from the veins to the intestines. The intestines now becoming inflated increase intra-abdominal tension, which in turn squeezes the blood out of the abdominal veins to the right heart. After this manner gas accumulation in the intestines is, as I view it, distinctly a process of compensation. It is not always easy to determine the presence of free gas in the peritoneal cavity, and to prove that it is of extra-intestinal origin. If the intestinal reflex of contraction is present, one may positively exclude peritoneal tympanites. If a suspected neoplasm of the intestines is environed by tympanicity and the intestinal reflex is present, its connection with the intestines may be assumed to exist. Phantom tumors dependent on persistent gaseous distention of a knuckle of intestine will yield the intestinal reflex of contraction and will at once dispel any doubt regarding the character of the tumor. Congenital or acquired dilatation of the colon may also be determined by this reflex. While ordinary percussion is elusive in differentiating the large from the small intestine, the intestinal reflex will aid us in separating one from the

other. Now the intestinal reflex is more pronounced in the small than in the large intestine, hence if we wish to separate one from the other, we elicit the reflex close to the suspected position of the colon, and percussion will soon make evident the tympanitic colon tone from the dull tympanicity present in the small intestine. Proceeding in this way along the entire course of the colon, we can define the latter with relative accuracy. My modified method of auscultatory percussion will make this definition more evident. This method applied to the colon consists essentially of placing the chest-piece of the stethoscope over the colon, and while the finger continues to percuss directly one of the lower ribs, the chest-piece of the instrument is carried along gradually until a difference in tone becomes evident. In this method the chest-piece of the stethoscope only is changed, the point of percussion always remaining the same. Elicitation of the lower liver border is facilitated by the intestinal reflex. After the latter is executed close to the situation of the lower border of the liver, the latter becomes easily defined by light percussion. What I have called the liver reflex must not be confounded with the intestinal reflex—the former being a retraction of the liver border consequent on irritation of the skin contiguous to the lower border of the liver.

The site of an intestinal obstruction, the differentiation of gas, an exudate, or fecal matter may be facilitated by the intestinal reflex.

The *intestinal reflex of dilatation* may be employed for the same purpose as the reflex of contraction, but chiefly as a control method, for if the reflex obtained is really the intestinal reflex of contraction, it must be dispelled at once by the counter-reflex of dilatation.

The Clinical Value of the Stomach Reflexes.—Here the stomach reflex of contraction is the more important, the counter-reflex of dilatation being only employed for control purposes. I need not expatiate in detail on the practical value of these reflexes. The stomach reflexes are only of avail when elicited in Traube's space, for if they are attempted at any other point the maneuver necessary to evoke them will also bring out the intestinal reflexes. Conducted however only in the area of Traube, any reflex evoked will be essentially associated with the stomach and not with the intestines. The motor power of the stomach may be determined accurately as already indicated in describing the stomach reflex of contraction. It may be necessary to differentiate a left-sided pneumothorax from a distended stomach, or a diaphragmatic hernia. In pneumothorax the stomach reflex of contraction would not be present, but would be evident in the other two conditions. The presence of a neoplasm and its association with the stomach may be shown to exist by aid of the stomach reflex of contraction, for elicitation of the latter will cause a dislocation of the growth upward and to the left. A sensitive point supposed to be connected with the stomach would likewise be dislocated by the same maneuver if really connected with the stomach.

I will not touch on the therapeutic value of the foregoing reflexes, for what has already been said suggests many possibilities in this direction.

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